# Low-carbon optimalisation modeling with Rubic Cube based interpretation (three-dimensional project development process)

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**Abstract**

*There are various software development models evolved in the industry over the years. Each model has its own advantages, limitations, and constraints. These models are often bound to some organization, which further develops, supports, and promotes the methodology. A specific development model might not be suitable for all projects. Technology, resources constraints, time to market, and rapidly changing customer needs are different factors that a Project Manager must consider to evaluate and adopt a development model for a given project cycle. The Rubik's Cube software development methodology (RCM) is a general-purpose methodology, which is extremely useful in today's software development life cycle analysis and project management applications.*

**Key words:** *low-carbon economy, sustainable system, three dimensional modeling, Rubik Cube solutions, layer-by-layar method*

**Tartalmi kivonat**

*Létezik néhány szoftverfejlesztési modell, amelyeket az ipari fejlesztések területén alkalmaznak, és mindegyiknek megvan a maga előnye, hátránya, korlátoltsága. A modellek általában kötődnek valamilyen szervezethez is, akik továbbfejlesztik, támogatják, promótálják ezeket a módszereket. Egy specifikus fejlesztési modell azonban soha nem lehet minden projektekre alkalmas projektfejlesztési módszer. A technológiák, a források korlátozottsága, a piacra jutás ideje, a gyorsan változó fogyasztói igények azok a speciális faktorok, amelyeket a projekt menedzsereknek figyelembe kell venniük, mikor egy fejlesztési modellt adoptálnak vagy*

*megvalósítanak a saját projekt ciklusaik esetében. A Rubik Kockás szoftverfejlesztési módszer (Rubik's Cube software developmet methodology - RCM) egy általános célrendszerű módszertan, amely rendkívül hasznos megoldást kínálhat minden területen, így például a szoftverek életciklusainak a modellezésére is. Az RCM modell különösen hasznos régi szoftverek felújításban, a kifutó szoftveralkalmazások új fogyasztói igényeknek történő megfeleltetésében. A Rubik kocka kirakásának legismertebb módszere a layer-by-layer módszer, mely módszer alapvetően a sorról sorra történő kirakást követi, és könnyen értelmezhető a szoftverek újraprogramozásának folyamatában. Kerestük a módszer alkalmazásának lehetőség a low-carbon fejlesztési programokban, és a szakirodalom elemzések, előzetes módszertani értékelés alapján megfogalmazható volt az a hipotézis, mely szerint a Rubik kocka 'layer-by-layer' kirakási módszer alkalmas a low-carbon projektfejlesztés folyamatának többdimenziós modellezésére és a fenntarthatósági szempontok figyelembe vételére a projektfejlesztések során is.*

**Kulcsszavak:** *low-carbon fejlesztés, fenntarthatóság modellezése, Rubik Kocka, alternatív energia*

## Introduction

The « low-carbon optimalisation » divides a project into multiple components, it is not always necessary for each component to interact with other four components. While communication across components is the key, it is not mandatory that each component talks to every other component directly. Sometimes the communication is achieved via an interface cable or interfacing component. Important attribution – when we are executing acceptance technical relevancies at the blue side it is not always required to view the market opportunity that generates the executable for the project. Another example could be the financial feature (liquidity), which can be used in different form and independent from the market demands (Anderson-Doig 2000). Very important system attribution is that - some components of the project development require more frequent interaction amongst then others. From this aspect is very clear why so important the three dimensional project development structure. Generally we are planning and working only with two-dimensional strategic systems. The three-dimensional interpretation of the Rubik's Cube model will show to us the practical benefits of the sustainable project concept. For the deeper

understanding the low-carbon project development protocol have to get acquainted with the meaning of the different sides.

## The basis of the low-carbon economy concept

There is an urgent need to transition to a low carbon economy to address the global challenges of diminishing fossil fuel reserves, climate change, environmental management and finite natural resources serving an expanding world population.
The main priorities in a low-carbon economy:

- All waste should be minimized - reduce, reuse, recycle,
- Energy should be produced using low carbon energy sources & methods - renewable & alternative energy sources, fuels & sequestration,
- All resources (in particular energy) should be used efficiently - more efficient energy conversion devices, combined heat & power,
- Wherever practical local needs should be served by local production - food, materials, energy,
- There is high awareness and compliance with environmental and social responsibility initiatives - industry, commerce and individuals (LCE Ltd, 2011).

In the case of low-carbon economy it is very difficult to manage these types of requirements. We take into account the above mentioned priorities at the same time by using the Rubik's Cube protocol. This protocol is a good process to manage the sustainable development goals.

## Material and methods

The project development basically is an optimalisation process, which is based on different optimalisation fields. In the case of « low-carbon optimalisation » we have selected four different components: strategic fittings, market fittings, technical fittings, financial fittings.

The four sides (red, green, blue, orange) of this model are mapped to different project components, two sides (white and yellow) of the Cube are mapped to the input and output side of our project:

STRATEGIC FIT (RED SIDE)

MARKET OPPORTUNITIES (GREEN SIDE)

FEASIBILITY/TECHNICAL DETAILS (BLUE SIDE)

FINANCIAL EFFECTS (ORANGE SIDE)

INPUTS AND RESULTS (WHITE SIDE)

OUTPUTS AND RESULTS (YELLOW SIDE)

The « low-carbon optimalisation » divides a project into multiple components, it is not always necessary for each component to interact with other four components. While communication across components is the key, it is not mandatory that each component talks to every other component directly. Sometimes the communication is achieved via an interface cable or interfacing component. Important attribution – when we are executing acceptance technical relevancies at the blue side it is not always required to view the market opportunity that generates the executable for the project. Another example could be the financial feature (liquidity), which can be used in different form and independent from the market demands (Anderson-Doig 2000). Very important system attribution is that - some components of the project development require more frequent interaction amongst then others. From this aspect is very clear why so important the three dimensional project development structure. Generally we are planning and working only with two-dimensional strategic systems. (Two-dimensional structure shows the Figure 1.)

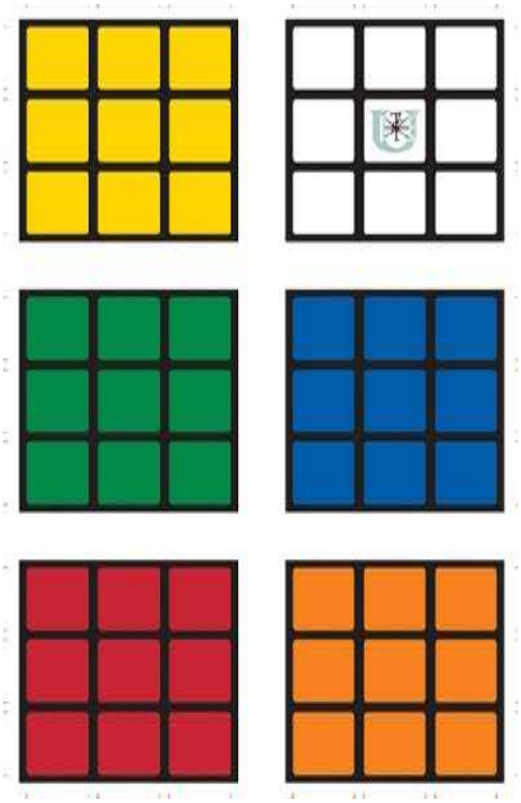

FIGURE 1: The two-dimensional parts of the Rubik's Cube by colours

The three-dimensional interpretation of the Rubik's Cube model will show to us the practical benefits of this project concept. For the deeper understanding the low-carbon project development protocol have to get acquainted with the meaning of the different sides.

| Colours | Meanings |
|---|---|
| white | INTPUTS AND RESULTS - Input requirements, market and governmental regulations to the products and services. |
| yellow | OUTPUTS AND RESULTS - Consumer's requirement, real value of the outputs (product and services). |
| red | STRATEGIC FIT - Relevant innovations to the profile, synergies and cooperation with other strategies (local /company/, sectoral, national, EU level). |
| green | MARKET OPPORTUNITIES - Market possibilities, position on the real and artificial market segments. |
| blue | FEASIBILITY - Harmony of the technological and market possibilities. Technical risks and opportunities. |
| orange | FINANCIAL EFFECTS - Type of finance, governmental tools, taxation, currency risk, liquidity. |

Table 1.: Meaning of sides of the Rubic's Cube

**Key solution: the Layer-by-layer method**

How to solve a Rubik's Cube (standard cube (3x3x3)) is the recurrent question that we make ourselves when we see a scrambled cube for the first time. Having billions of combinations, it is nearly impossible to solve a Rubiks Cube by trial and error. There are several ways to solve a Rubik's Cube using the easiest methods for solving the cube for beginners. The simplest method of resolution for all the models, is to solve the cube by layers, beginning from the Bottom layer to the Top layer. The layer by layer method that is often used for the 3×3×3 cube is usually used on the Rubik's Revenge. One of the most common methods is to first group the centre pieces of common colours together, then to pair edges that show the same two colours. Once this is done, turning only the outer layers of the cube allows it to be solved like a 3×3×3 cube (Rubik's Revenge, 2011). In the case of layer-by-layer method we can find the analogy between the project development process and Rubik's Cube solving. On the next Figures 2., 3., 4., 5., 6., 7. you can follow the Rubic's Cube layer-by-layer solution process and the project development process in

parallel. From the explanation at the Figures we can see the coherences and synergies among the project development components.

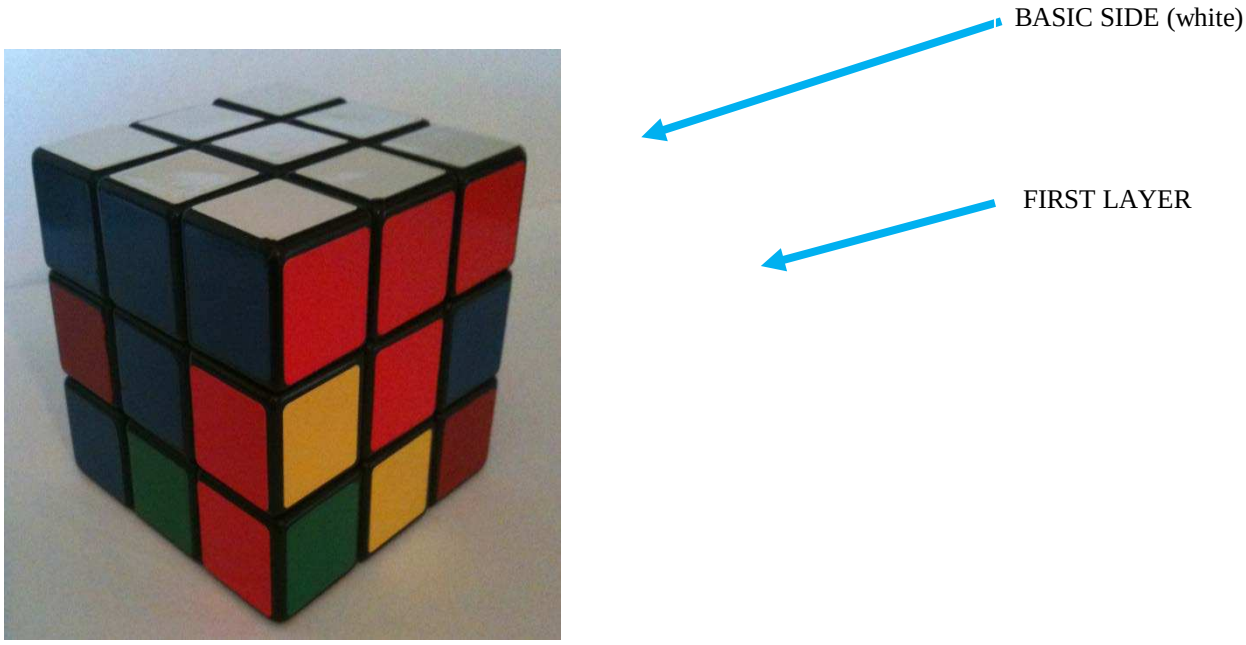


FIGURE 2: The first side (input side) and layer – the basis of the project development

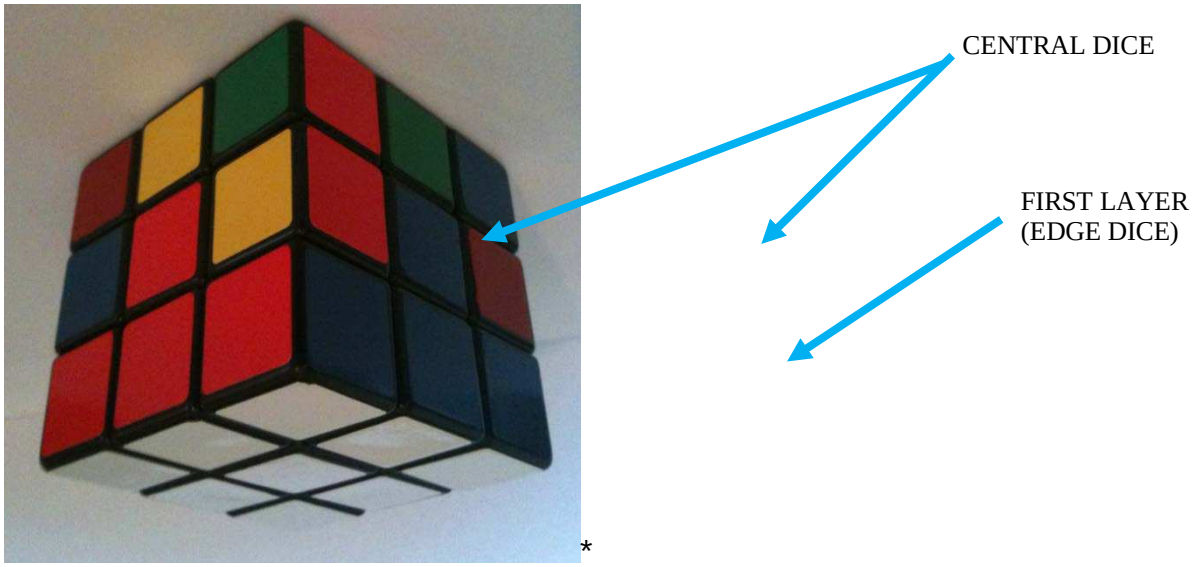


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FIGURE 3: Central dice – it shows the coherences and structure of the project development process (the central dice is a fix point of the cube and fix character of the project component)

Each side and each dice of the Rubik's Cube harmonizes with the element of the project development. The central dices are the stabile components of the cube sides and project components. We can't move them from the original stand. The edge dices are mean coherent contact between two colours and two project attributions.

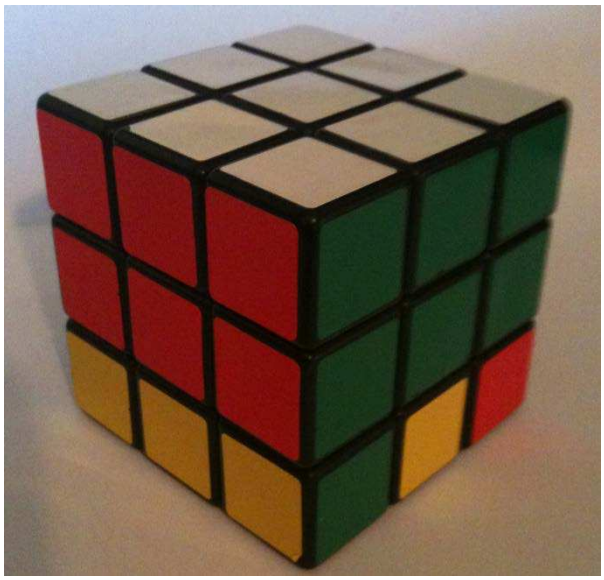


FIGURE 4: Above the first layer - second layer will shows the harmony among the colours and project development components

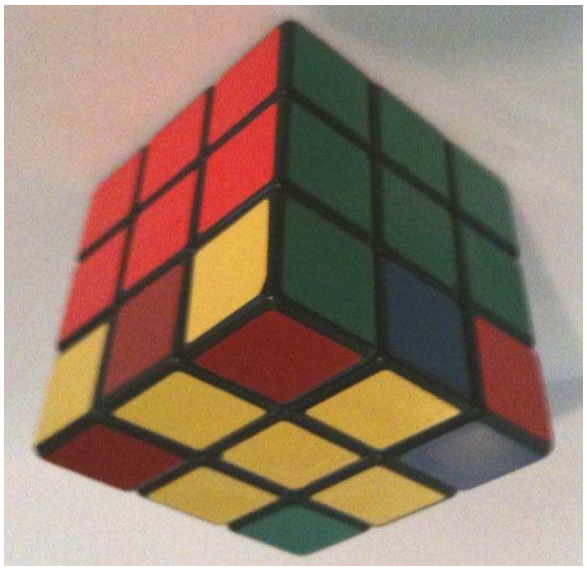


FIGURE 5: The mystical yellow cross

After the second layer the yellow cross on the upper side means – harmonization of the strategic targets and the consumer's requirements. In this step we have to find the final element of the final colour. The sixth colour will shows to us the right direction to the success. By this way we can find the relevant « consumer requirement » in the case of project development goals.


FIGURE 6: Strategic and consumer settings in the case of project development process

The „consumer" side fitting on the output side is the most important moment before the finalization of the Cube. Because of the sustainability the most important movement - input (white) side and output (yellow) side have to be in coherences before finalization.

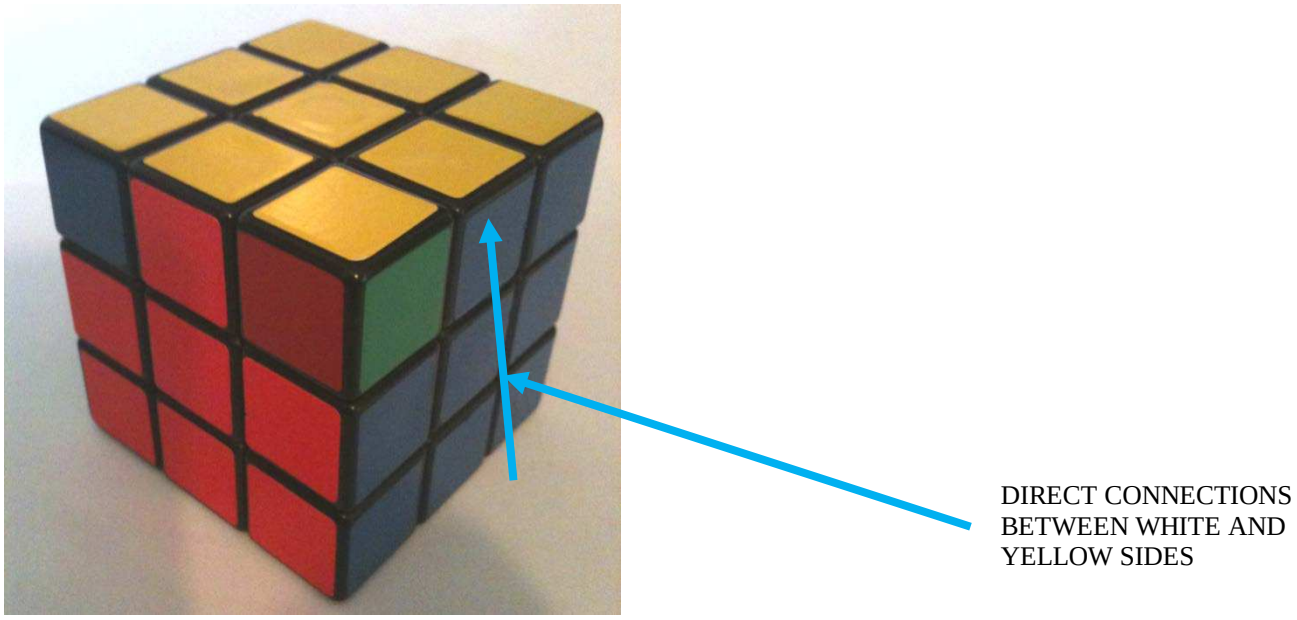


FIGURE 7: Creation stable contact between the input and output sides on four channels

*After the harmonization between the input and output sides and requirements we have left only one engagement – to find the final element of the Cube.*

## Conclusions

The described “low-carbon project protocol” provides a helpful aspects of handling a sustainable project development by making an analogy to the way a Rubik’s cube layer-by-layer solution. This protocol covers features like parallel development of components, identifying logical groupings of components, segregating them based on their dependencies on each other. The Rubik’s Cube based low-carbon project protocol enables a project to deliver a working component even when rests of the components are not ready for a customer facing delivery.

Findings:

- Layer-by-layer solution is the model solution of the innovations – we can easy follow the innovation process step by step.
- Each side and each dice of the Rubik’s cube harmonizes with the element of the project development :
  - A. central dice (stabile component of the cube side (relevant color) and project phase).
  - B. edge dice (coherent contact between two colours and two project attributions)
  - C. corner dice (very complex and complicate contact between three different colour and project phase)
- The low-carbon project development process is a parallel project protocol with layer-by-layer Rubik solution. This type of algorithm can define a special sustainable and low-carbon (minimal material and energy input) development.

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